PROC. ENTOMOL. SOC. WASH.
105(4), 2003, pp. 1056–1059

NOTE

First Records of Hymenopterous Larval-Pupal Parasitoids of *Anastrepha fraterculus* (Wiedemann) (Diptera: Tephritidae) in the Northwestern Province of Catamarca, Argentina

In the northwestern provinces of Catamarca, Tucumán, Salta, and Jujuy (Argentina) there are important citrus-growing areas where the native *Anastrepha fraterculus* (Wiedemann) and the exotic *Ceratitis capitata* (Wiedemann) coexist in wild and commercially grown, native and exotic fruit. However, most previous fruit fly parasitoid surveys were focused largely in citrus orchard areas of Tucumán (Hayward 1940, Fernández de Araoz and Nasca 1984, Ovruski 1995). No published reports exist on the fruit fly parasitoid fauna of Catamarca. Only a small amount of information on fruit flies has been published, mainly based on specimens caught in traps in several Departamentos of Catamarca Province (Rosillo 1953, Vattuone et al. 1999).

Based on the above, the aim of this study was to survey exotic host plant species commonly infested by both *A. fraterculus* and *C. capitata*, and to identify all larval-pupal parasitoids associated with these tephritid species in the southeastern region of Catamarca Province, as well as to determine the infestation levels in each fruit species sampled.

From November 1994 to April 1995 (rainy summer season), fruit samples from seven exotic plant species of four families were collected in family orchards and in patches of disturbed wild vegetation adjacent to citrus groves throughout the localities of La Viña (28°01′S, 65°34′W, 590 m altitude) and Sumampa (28°03′S, 65°31′W, 550 m), southeastern Catamarca. The climate of these counties is defined as temperate-humid, with a dry winter. Native vegetation is a subtropical mountain rainforest locally known as "Yungas forest" which is distributed throughout NW Argentina.

The fruit samples consisted only of fallen ripe fruit, and ranged in number from 20 to 150 fruit, depending on fruit availability. In the laboratory, each fruit was counted and weighed, then placed in closed styrofoam boxes with damp sand in the bottom as a pupation substrate. All formed pupae were removed weekly and the *A. fraterculus* and *C. capitata* pupae were separated using external pupal characters (White and Elson-Harris 1992). These pupae were transferred to plastic trays containing sterilized humid sand. Each tray was then placed inside a sealed wooden box and kept inside a room at 25 ± 1°C and 75 ± 5% relative humidity for four months. S. Ovruski identified all emerged flies and parasitoids. Voucher specimens are placed in the insect collection of the Fundación Miguel Lillo in San Miguel de Tucumán. All parasitization rates and fruit infestation levels reported here are based on the number of emerged adult flies and parasitoids, and on the number of fruit fly pupae per kg of fruit, respectively.

A total of 129 (12.8 kg) sweet oranges (*Citrus sinensis* (L.) Osbeck), 93 (11.5 kg) sour oranges (*Citrus aurantium* L.), 56 (12.7 kg) grapefruit (*Citrus paradisi* Macfadyn) (all Rutaceae), 345 (13.4 kg) peaches (*Prunus persica* (L.) Batsch), 118 (5.2 kg) plums (*Prunus domestica* L) (both Rosaceae), 231 (5.3 kg) figs (*Ficus carica* L., Moraceae), and 278 (12.2 kg) guavas (*Psidium guajava* L., Myrtaceae) were sampled. Of these fruit samples, 998 and 892 pupae of *A. fraterculus* and *C. capitata* were recovered, respectively. All the *Citrus* species and *F. carica* were only infested by *C. capitata*, whereas the *Prunus* species and *Psidium guajava* were simultaneously infested by both *A. fraterculus* and *C. capitata*. The lowest infestation rates were recorded in *C. sinensis*, *C. paradisi*, and *C. aurantium* (8.9, 3.7, and 2.6 pupae/kg of fruit, respectively), the largest fruit species sampled,

while the highest infestation level by *C. capitata* (43.4 pupae/kg of fruit) was found in fig, the smallest fruit species sampled. In the case of the *Prunus* species, *P. persica* was mainly infested by *C. capitata* (21.8 *C. capitata* pupae/kg fruit vs 12.0 *A. fraterculus* pupae/kg fruit), whereas *P. domestica* was infested largely by *A. fraterculus* (38.5 *A. fraterculus* pupae/kg fruit vs 12.7 *C. capitata* pupae/kg fruit). The highest infestation rate by *A. fraterculus* was recorded in guava (55.3 pupae/kg fruit). In this fruit species, the infestation level by *C. capitata* was low (8.3 pupae/kg fruit). These data on fruit infestation rates add further evidence about the predominance of *C. capitata* in *Citrus* species and fig, and about the importance of *P. guajava* as principal host of *A. fraterculus* in the southeastern part of Catamarca, where the climate is warm and humid. Similar observations were made in citrus orchard areas of the northwestern province of Tucumán, where guavas are abundant in patches of wild vegetation adjacent to crops (Ovruski, Schliserman and Aluja, unpublished data).

From *C. capitata* pupae, 485 adult flies were recovered, and from *A. fraterculus* pupae, 561 adult flies and 68 hymenopterous parasitoids were obtained. The following parasitoid species were reared in association with *A. fraterculus*: *Doryctobracon areolatus* (Szépligeti), *D. brasiliensis* (Szépligeti), and *Utetes anastrephae* (Viereck) (all Braconidae, Opiinae), and *Aganaspis pelleranoi* (Brèthes) (Figitidae, Eucoilinae). Table 1 summarizes parasitoid species abundance, and parasitization rates of *A. fraterculus* based on fruit species. The three braconid species are specialized, solitary, koinobiont endoparasitoids of *Anastrepha* larvae, which are attacked inside host fruit. *Doryctobracon areolatus* and *U. anastrephae* are widely distributed in the Neotropical Region ranging from the southern United States to Argentina, whereas *D. brasiliensis* is known only from southern Brazil and Argentina (Ovruski et al. 2000). The eucoiline *A. pelleranoi* is another larval-pupal endoparasitoid of *Anastrepha* and *C. capitata* larvae, which occurs naturally from central Mexico to northern Argentina (Ovruski et al. 2000). All native parasitoid species recovered during this study are new records for Catamarca. These four species have also been collected in the Yungas forest areas of neighboring Tucumán province (Fernández de Araoz and Nasca 1984, Ovruski 1995). Thus, the data presented here show that all these parasitoid species appear to be common and abundant at least in the southern portion of the Yungas forest. However, these records do not represent the southernmost natural distribution range in the Americas for these four parasitoid species. The authors of this note have recently collected close to 400, *A. fraterculus* puparia from several Myrtaceae species in Santa Lucía, located at 29°S, 59°W in the northeastern Province of Corrientes. From these puparia, we have been able to obtain specimens of the four parasitoid species cit-

Table 1. Parasitization rates, number and relative abundance of parasitoids reared from *Anastrepha fraterculus* pupae in three host plant species sampled in La Viña and Sumampa localities, southeastern Catamarca, between November 1994 and April 1995.

Host Plant	Total of recovered parasitoids (and % parasitism)	Parasitoid species, number of specimens and relative abundance (%) in the fruit samples			
		D. areolatus	*D. brasiliensis*	*U. anastrephae*	*A. pelleranoi*
Guava	42 (10.5)	19 (45.2)	7 (16.7)	3 (7.1)	13 (31.0)
Peach	15 (13.2)	3 (20.0)	5 (33.3)	0	7 (46.7)
Plum	11 (9.6)	4 (36.4)	2 (18.2)	1 (9.0)	4 (36.4)
Total:	68 (10.8)	26 (38.2)	14 (20.6)	4 (5.9)	24 (35.3)

ed here (Ovruski and Schliserman, unpublished data). Both *A. pelleranoi* and *D. areolatus* were also recorded from rainforest areas in Misiones (northern part of northeastern Argentina) (Ogloblin 1937) and from irrigated fruit producing valleys in desert areas in La Rioja (southern part of northwestern Argentina), but the presence of these two parasitoid species in this last region was probably via their introduction in fruit infested with *A. fraterculus* or *C. capitata* larvae parasitized by either the opiine or the eucoiline parasitoid transported from northern Argentina (Ovruski 2002).

Doryctobracon areolatus is often the most abundant species of *Anastrepha*-parasitoid guilds throughout its distribution range in the Neotropics (Sivinski et al. 2000). Interestingly, *A. pelleranoi* was as adundant as *D. areolatus* in this study. This relative abundance of *A. pelleranoi* has been observed only from fruit samples collected from the ground in a recent fruit fly parasitoid survey carried out in Tucumán (Ovruski, Schliserman, and Aluja, unpublished data). As noted by Ovruski (1994) and Aluja et al. (2001), *A. pelleranoi* prefers to search for host larvae in ripe fruit that has fallen from the tree, and it reaches its hosts by entering wounds in fruit.

No parasitoids from *C. capitata* pupae were recovered in this study. This information coincides with the data obtained from the fruit fly parasitoid surveys in Salta and the northeastern Province of Corrientes (Ovruski, unpublished data). However, few *A. pelleranoi* specimens have been obtain from *C. capitata* puparia in Tucumán (Ovruski 1995). This eucoiline species have a broad host preference, including *C. capitata* (Wharton et al. 1998). Other parasitoids species, such as the braconids *D. areolatus* (Fernández de Araoz and Nasca 1984) and *U. anastrephae* (Nasca 1973), have been supposedly reared from *C. capitata* puparia, but these records need verification.

Acknowledgments.—We thank Martín Aluja for his many useful comments on fruit fly parasitoids. Useful critical reviews were made by A. L. Norrbom and an anonymous referee. Financial support was provided by CONICET and CIUNT.

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Sergio M. Ovruski and Pablo Schliserman, *Instituto Superior de Entomología "Dr. Abraham Willink"-FCNeIML-UNT, CONICET, Fundación Miguel Lillo—CIRPON, Miguel Lillo 251, (T4000EBG) San Miguel de Tucumán, Argentina (e-mails: ovruski@infovia.com.ar; schli@networld.com.ar)*